

## **REMARKS/ARGUMENTS**

### **Status of Claims:**

In the application, claims 2-12, 14-18, 20-30, 32-36 are currently pending. Of these claims, claims 2, 3, 14-18, 20-24, 32, 33, 36 are currently amended and claims 1, 13, 19 and 31 are cancelled. Among the currently pending claims, claims, 2-12, 14, 20, 26, 27, 32-36 were deemed allowable.

### **Claim Rejections under 35 U.S.C. § 112 (2nd)**

In the Office Action claims 1-36 were rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to point out and distinctly claim the subject matter which applicant regards as the invention. In particular the Office Action noted that the term “non-cellular membrane” was unclear, since the term referred to polymeric and liquid membranes. Further, claims 21-23 did not provide additional structure to the apparatus claim 19.

In response, Applicant notes that both polymeric and liquid membranes are contemplated as membranes used in the claimed invention, as shown in amended claims 2 and 14. These membranes are claimed in contrast to struvite and calcite crystallization induced by cellular membranes of *myxococcus xanthus* taught in Gonzalez-Munoz, M.T., N. BenOmar., M. Martinez-Canamero., M. Rodriguez-Gallego., A.L. Galindo., and J.M. Arias. 1996. Struvite and calcite crystallization induced by cellular membranes of *Myxococcus xanthus*. J. Cryst. Growth 163:434-439 [Paragraphs 8, 124], see also Information Disclosure Statement submitted on January 20, 2006. Further, Applicant believes that Sec. 112, second paragraph rejection is moot in view of the amendments based on amended claims 1, 2, 31 and 32. Accordingly, claims 2-12,

14-20, 24-30, 32-36 should be deemed patentable with regard to indefiniteness issues. Further, as amended claims 21-23 provide additional physical properties of the first and second chamber claimed in claim 20, Applicant believes that claims 21-23 are also in allowable form.

**Claim Rejections under 35 U.S.C. § 102 (b)**

In the Office Action claims 19 and 24 were rejected under 35 U.S.C. Sec. 102(b) as being anticipated by Yamamoto (US Patent 5,928,853). In particular, the Office Action noted that Yamamoto disclosed the apparatus as claimed in claims 19 and 24, as shown in Fig. 2, element K, column 16, and last paragraph. Yamamoto, teaches an ultrafiltration membrane which requires a synthetic semipermeable membrane under pressure (Col. 15, lines 42-48) and a cation exchange membrane K for desalting by electrodialysis using 10V to 30V DC for the manufacture of silver halide emulsion. Yamamoto, however, does not teach an apparatus for removing phosphorus from phosphorus containing waste, comprising: (a) a first chamber for containing phosphorus containing waste; (b) a second chamber for containing suitable ionic salts and solutions; and (c) a cation exchange membrane separating the first and second chambers, wherein the membrane is held and sealed between the first and second chambers and wherein the membrane is a polymeric acrylic membrane containing functional groups selected from the group consisting of sulfonic acid, carboxylate, sulfate, sulfonate, perfluorosulfonate, phosphate, phosphonate and alcohol.

Applicant believes that Yamamoto is non-analogous art, since use of membranes in the manufacture of silver halide emulsion is far removed from use of membranes in treatment of waste and removal of struvite from phosphorus-containing waste. As the Examiner also noted Yamamoto failed to disclose membranes made from acrylic polymer with sulfonic acid,

therefore, not every element of the claimed invention as depicted in amended claims 20 and 24 are disclosed in this reference, and none of the cited references, whether taken singly or in combination with each other teach or suggest Applicant's claimed invention. Accordingly, Applicant respectfully requests reconsideration of rejected claims as not being anticipated and novel from cited references.

**Claim Rejections under 35 U.S.C. § 103 (a)**

In the Office Action claims 1, 13, 15, 16, 18, 20, 25, 28, 30 and 31 were rejected under 35 U.S.C. Sec. 103(a) as being unpatentable. Claim 20 was found unpatentable over Yamamoto (US Patent 5,928,853), as applied to claim 19, further in view of Hodgdon (US Patent 5,510,394). Claims 1, 13, 15, 16, 18, 25, 28, 30 and 31 were found unpatentable over Hirth et al (US Patent 6,387,272). In particular the Office Action noted for claim 20 that while Yamamoto failed to disclose a membrane made from acrylic polymer with sulfonic acid, Hodgdon disclosed a membrane as claimed in claim 20. Further, the Action noted that would have been obvious to one of ordinary skill in the art to contact a feed stream with a membrane as claimed in claim 20. Also for claims 1, 13, 15, 16, 18, 25, 28, 30 and 31 the Action noted that Hirth disclosed removal of struvite by membrane filtration with a reverse osmosis membrane, where the membrane is polymeric, e.g. Polyamide, as claimed in claim 13. Similarly bioliquids, pH conditions, filtration and pre-treatment of membranes were disclosed in Hirth. Claims 17 and 29 were unpatentable in view of Hirth, as applied to claims 1 and 25 and further in view of Josse et al (US Patent 6,692,642), since Josse taught treatment of manure with ferric chloride.

As for claim 20, neither Yamamoto nor Hodgdon, whether singly nor combination teaches an apparatus for removing phosphorus from phosphorus containing waste, comprising:

(a) a first chamber for containing phosphorus containing waste; (b) a second chamber for containing suitable ionic salts and solutions; and (c) a cation exchange membrane separating the first and second chambers, wherein the membrane is held and sealed between the first and second chambers and wherein the membrane is a polymeric acrylic membrane containing functional groups selected from the group consisting of sulfonic acid, carboxylate, sulfate, sulfonate, perfluorosulfonate, phosphate, phosphonate and alcohol. Also, as mentioned earlier, the art of related to manufacture of silver halide emulsion is quite removed from the art related to removal of phosphorus as struvite from bio-waste, and other materials. Further, as the office Action noted Yamamoto failed to disclose membrane made from acrylic polymer with sulfonic acid, and accordingly, Yamamoto and Hodgdon whether taken singly or in combination do not teach an apparatus for removing phosphorus from phosphorus containing waste. There is no motivation to combine these cited references or other cited references to teach the invention as claimed in claim 20.

As for Claims 15, 16 and 18, again Hirth does not teach precipitating phosphorus from the waste as struvite, wherein the membrane is negatively charged and is organized as monolayers, micelles, lamellar bilayers or bilayer vesicles, or, wherein the membrane is a polymeric membrane selected from the group consisting of negatively charged sulfonic acid, carboxylate, sulfate, sulfonate, perfluorosulfonate, phosphate, phosphonate and alcohol, and combinations thereof, embedded in a nylon or acrylic membrane.

As to claim 17, Josse teaches use of ferric chloride for chemical removal of phosphorus that is not biologically removed from anoxic zone 2. Hirth in view of Josse or other cited references taken singly or in combination does not teach a method of removing phosphorus from phosphorus containing waste, comprising the steps of: (a) contacting the phosphorus containing

waste with a membrane; (b) precipitating phosphorus from the waste as struvite, wherein the membrane is negatively charged and is organized as monolayers, micelles, lamellar bilayers or bilayer vesicles; and (c) contacting sewage biosolid with ferric chloride and precipitating phosphorus. Further, since claims 15, 16, 17 and 18, depend from allowable claim 2, Applicant believes that all dependent claims having limitation or the parent claim should be allowable.

As to claims 25, 28 and 30, while Hirth discloses precipitation of Magnesium containing phosphates by addition of magnesium salt or hydroxide (Col. 4 second paragraph) and Josse teaches use of ferric chloride for chemical removal of phosphorus that is not biologically removed from anoxic zone 2, as the Office Action recognized, Hirth in view of Josse does not teach use of polymeric membrane. Moreover, improper hindsight construction should not be used to combine references to come upon to claimed invention especially when no suggestion is made in these references to either use a first polymeric membrane or a second monomolecular membrane for removal of phosphorus as secondary struvite.

As to claim 29, Josse teaches use of ferric chloride for chemical removal of phosphorus that is not biologically removed from anoxic zone 2, as mentioned above. However, Hirth in view of Josse or other cited references taken singly or in combination does not teach (a) contacting the sewage with a first polymeric membrane reactor and removing phosphorus as primary struvite; (b) adding Mg to make the sewage supersaturated with struvite; (c) contacting the sewage with a second monomolecular membrane and removing phosphorus as secondary struvite further and (d) contacting sewage biosolid with ferric chloride and precipitating phosphorus.

Since at least one claimed element in claims 15-18, 25, 28, 29 and 30 are completely missing from the cited references whether taken singly or in combination, the cited references do not teach the invention as claimed.

Accordingly, Applicant respectfully requests reconsideration of claims 15, 16, 17, 18, 25, 28, 29 and 30 in view of the above remarks.

Overall, Applicant believes that the claimed invention as described in claim 2-12, 14-18, 20-30, 32-36 is patentable and enabled. Applicant believes that all the issues have been correctly addressed and earnestly requests a prompt and favourable decision.

### **CONCLUSIONS**

It is respectfully submitted that claims 2-12, 14-18, 20-30, 32-36 are in condition for allowance and notice to that effect is earnestly solicited. The Examiner is urged to telephone the undersigned in the event a telephone discussion would be helpful in advancing the prosecution of the present application. The Office is further authorized to charge the processing fee or any other surcharges, or underpayment, including extension of time, as deemed necessary and appropriate to the Deposit Account 07-1509 of Godfrey & Kahn, S.C.

Respectfully submitted,

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